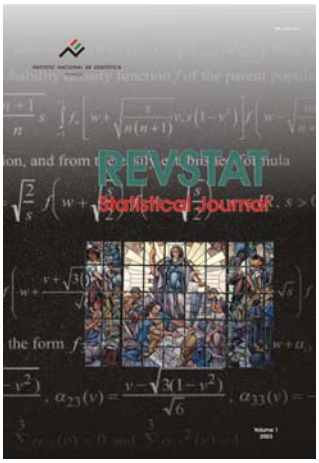
17 March, 2008

Estatísticas Gerais

Volume 6, Number 1, March 2008

REVSTAT- STATISTICAL JOURNAL

REVSTAT-STATISTICAL JOURNAL, Volume 6, No. 1 – March 2008



In 2003 the National Statistical Institute launched the scientific statistical journal **REVSTAT-STATISTICAL JOURNAL**, published in English two times a year, with a prestigious international Editorial Board, which came to substitute the *Revista de Estatística* [Statistical Review], published in Portuguese between 1996 and 2002.

The aim of the Editorial Board of **REVSTAT** is to publish articles of high scientific content, developing innovative statistical scientific methods and introducing original research, grounded in substantive problems, covering all branches of Probability and Statistics. Surveys of important areas of research in the field are also welcome.

REVSTAT hopes to become a place where scientists may feel proud of publishing their research results changing the character of the previous *Revista de Estatística* from a national to an international scientific journal.

For more information about **REVSTAT**, namely on-line articles, subscription of the publication, and submission of papers, please visit the link of the National Statistical Institute's website: http://www.ine.pt/revstat.html

This Volume of **REVSTAT: Volume 6, No. 1 - March 2008**, is about **"Statistics of Extremes and Related Fields"** and includes six articles. Their abstracts are presented below:

MINIMUM-VARIANCE REDUCED-BIAS TAIL INDEX AND HIGH QUANTILE ESTIMATION

Authors: *Frederico Caeiro* and *M. Ivette Gomes*.

Heavy tailed-models are quite useful in many fields, like *insurance*, *finance*, *telecommunications*, *internet traffic*, among others, and it is often necessary to estimate a *high quantile*, i.e., a value that is exceeded with a probability *p*, small. The semi-parametric estimation of this parameter relies essentially on the estimation of the *tail index*, the primary parameter in *statistics of extremes*. Classical semi-parametric estimators of extreme parameters show usually a severe bias and are known to be very sensitive to the number *k* of top order statistics used in the estimation. For *k* small they have a high variance, and for large *k* a high bias. Recently, new second-order "shape" and "scale" estimators allowed the development of second-order reduced-bias estimators, which are much less sensitive to the choice of *k*. Here we shall study, under a third order framework, minimum-variance reduced-bias (MVRB) tail index estimators, recently introduced in the literature, and dependent on an adequate estimation of second order parameters. The improvement comes from the asymptotic variance, which is kept equal to the asymptotic variance of the classical Hill estimator, provided that we estimate the second order parameters at a level of a larger order than the level used for the estimation of the first order parameter. The use of those MVRB tail index estimators enables us to introduce new classes of reduced-bias high quantile estimators. These new classes are compared among themselves and with previous ones through the use of a small-scale Monte Carlo simulation.

www.ine.pt | For further information: Communication Unit [Tel: +351.21.842.61.00 _ Fax: +351.21.842.63.73 _ uci@ine.pt]

A GEOSTATISTICAL EXPLORATORY ANALYSIS OF PRECIPITATION EXTREMES IN SOUTHERN PORTUGAL

Authors: *Ana Cristina Costa, Rita Durão, Amílcar Soares* and *Maria João Pereira.*

In Mediterranean climate regions, prolonged periods of unusually dry conditions reduce the availability of water resources and affect vegetation cover; while other areas can be affected by an increase in the number of heavy precipitation events, with an increase in the flood risk. Issues such as drought and erosive rainfall have been raising concern about the risks of land degradation and desertification. The main objective of this paper is to provide an insight of the geographic distribution of extreme precipitation events in the Southern region of continental Portugal, as a basis for a future study of the relationships between extreme rainfall patterns, both spatial and temporal, and desertification processes. The data used in this study are a set of 105 station records with daily precipitation observations for the period 1940–1999. This 60-year period was chosen to optimize data availability across the region, taking into consideration the quality control analysis performed. Among the numerous indices of extreme precipitation described in the literature, we selected three of them for an exploratory analysis: one index representing dry conditions, another one representing extremely heavy precipitation events and another index representing flood events. For each of these three indices, yearly trends and decadal space-time patterns are investigated. The results show no significant trends in the regional extreme indices. The geostatistical study concluded that the spatial patterns are more continuous in the last decade than the other ones before. The preliminary results of this study agree with other similar studies of the same region reported in the literature.

IMPROVING PROBABILITY-WEIGHTED MOMENT METHODS FOR THE GENERALIZED EXTREME VALUE DISTRIBUTION

Authors: *Jean Diebolt, Armelle Guillou, Philippe Naveau* and *Pierre Ribereau*.

In 1985 Hosking *et al.* estimated with the so-called Probability-Weighted Moments (PWM) method the parameters of the Generalized Extreme Value (GEV) distribution, the latter being classically fitted to maxima of sequences of independent and identically distributed random variables. Their approach is still very popular in hydrology and climatology because of its conceptual simplicity, its easy implementation and its good performance for most distributions encountered in geosciences. Its main drawback resides in its limitations when applied to strong heavy-tailed densities. Whenever the GEV shape parameter is larger than 0.5, the asymptotic properties of the PWMs cannot be derived and consequently, asymptotic confidence intervals cannot be obtained. To broaden the validity domain of the PWM approach, we take advantage of a recent extension of PWM to a larger class of moments, called Generalized PWM (GPWM). This allows us to derive the asymptotic properties of our estimators for larger values of the shape parameter. The performance of our approach is illustrated by studying simulations of small, medium and large GEV samples. Comparisons with other GEV estimation techniques used in hydrology and climatology are performed.

LINKING PARETO-TAIL KERNEL GOODNESS-OF-FIT STATISTICS WITH TAIL IINDEX AT OPTIMAL THRESHOLD AND SECOND ORDER ESTIMATION

Authors: *Yuri Goegebeur, Jan Beirlant* and *Tertius de Wet*.

In this paper the relation between goodness-of-fit testing and the optimal selection of the sample fraction for tail estimation, for instance using Hill's estimator, is examined. We consider this problem under a general kernel goodness-of-fit test statistic for assessing whether a sample is consistent with the Pareto-type model. The derivation of the class of kernel goodness-of-fit statistics is based on the close link between the strict Pareto and the exponential distribution, and puts some of the available goodness-of-fit procedures for the latter in a broader perspective. Two important special cases of the kernel statistic, the Jackson and the Lewis statistic, will be discussed in greater depth. The relationship between the limiting distribution of the Lewis statistic and the bias-component of the asymptotic mean squared error of the Hill estimator is exploited to construct a new tail sample fraction selection criterion for the latter. The methodology is illustrated on a case study.

www.ine.pt | For further information: Communication Unit [Tel: +351.21.842.61.00 _ Fax: +351.21.842.63.73 _ uci@ine.pt]

ON EXTREME VALUE ANALYSIS OF A SPATIAL PROCESS

Authors: *Laurens de Haan* and *Chen Zhou*.

One common way to deal with extreme value analysis in spatial statistics is by using the max-stable process. By employing a representation of simple max-stable processes in de Haan and Ferreira ([3]), we propose a stationary max-stable process as a model of the dependence structure in two-dimensional spatial problems. We calculate its two-dimensional marginal distributions, which creates the opportunity to estimate the dependence parameter. The model is used in Buishand, de Haan and Zhou ([1]) for a spatial rainfall problem.

TESTING EXTREME VALUE CONDITIONS — AN OVERVIEW AND RECENT APPROACHES

Authors: *Cláudia Neves* and *M. Isabel Fraga Alves*.

The aim of this paper is to give a brief overview about several tests published in the context of statistical choice of extreme value domains and for assessing extreme value conditions. Some of the most recent testing procedures encompassed in this framework will be illustrated using a teletraffic data set.

www.ine.pt | For further information: Communication Unit [Tel: +351.21.842.61.00 _ Fax: +351.21.842.63.73 _ uci@ine.pt]